

STANDARD FORM

$$A \times 10^n$$

1 — 10
(included) (not included)

$$23.5 \times 10^6 \quad \text{X}$$

$$1 \times 10^7 \quad \checkmark$$

$$2.35 \times 10^6 \quad \checkmark$$

$$10 \times 10^7 \quad \text{X}$$

$$0.235 \times 10^6 \quad \text{X}$$

WE CAN MOVE DECIMAL AND POWER CHANGES.

DECIMAL MOVES RIGHT, POWER REDUCES

DECIMAL MOVES LEFT, POWER INCREASE.

CONVERT FOLLOWING INTO STANDARD FORM:

$$1) \quad 348.76 \times 10^{6+2} = 3.4876 \times 10^8$$

left

$$2) \quad 384. \times 10^{7+2} = 3.84 \times 10^9$$

left

$$3) \quad 0.0961 \times 10^{4-2} = 9.61 \times 10^2$$

right

$$4) \quad 1362.71 \times 10^{-5+3} = 1.36271 \times 10^{-2}$$

left

$$5) \quad 0.00971 \times 10^{-8-3} = 9.71 \times 10^{-11}$$

right

$$6) \quad 36180000 = \underset{\text{left}}{36180000} \times 10^{0+7} = 3.618 \times 10^7$$

ADD / SUBTRACT MAKE POWERS OF TEN SAME

EXAM TIP: ALWAYS MAKE SMALLER POWER.
THE WORKING BECOMES SIMPLER.

$$1) (3.6 \times 10^7) + (2 \times 10^6)$$

$$(3.6 \times 10^{7-1}) + (2 \times 10^6)$$

$$36 \times 10^6 + 2 \times 10^6$$

$$(36 + 2) \times 10^6$$

$$38 \times 10^{6+1}$$

$$\boxed{3.8 \times 10^7}$$

$$2) (2.1 \times 10^9) - (3 \times 10^7)$$

2.10000...

$$(2.1 \times 10^{9-2}) - (3 \times 10^7)$$

$$210 \times 10^7 - 3 \times 10^7$$

$$(210 - 3) \times 10^7$$

$$207 \times 10^{7+2}$$

$$\boxed{2.07 \times 10^9}$$

MULTIPLY

Numbers are multiplied
Powers of ten are added.

$$1) (1.2 \times 10^6) \times (8 \times 10^5)$$

$$1.2 \times 8 = 9.6$$

$$\begin{array}{r} 12 \\ \times 8 \\ \hline 96 \end{array}$$

$$\boxed{9.6 \times 10^{11}}$$

DIVIDE

Numbers are divided
Powers of ten are subtracted.

$$2) (6.3 \times 10^8) \div (9 \times 10^3)$$

$$\begin{array}{r} 6.3 \times 10 \\ 9 \times 10 \\ \hline \end{array}$$

$$\begin{array}{r} 637 \\ 9010 \\ \hline = 0.7 \end{array}$$

$$0.7 \times 10^{5-1}$$

$$\boxed{7 \times 10^4}$$

ARRANGING

ARRANGE FOLLOWING IN INCREASING ORDER
STARTING FROM SMALLEST.

Rule: Make powers of ten same. (Bring to smallest power).

$$213.7 \times 10^5, 19.3 \times 10^{6-1}, 3.2 \times 10^{7-2}, 21.1 \times 10^{6-1}$$

$$193 \times 10^5, 3.2000 \times 10^{7-2}$$

$$213.7 \times 10^5, 193 \times 10^5, 320 \times 10^5, 211 \times 10^5$$

(3) (1) (4) (2)

Note: Write original values in answer space.

Ans: $\frac{19.3 \times 10^6}{\text{smallest}}, \frac{21.1 \times 10^6}{\text{smallest}}, \frac{213.7 \times 10^5}{\text{smallest}}, \frac{3.2 \times 10^7}{\text{largest}}.$

PRACTICE:

TYPE 1: WITHOUT WORD PROBLEMS.

- 1 (a) Express $217.3 \times 10^{2+2}$ in standard form. $= 2.173 \times 10^4$

Answer (a) 2.173×10^4 [1]

- (b) Arrange the following numbers in order starting with the smallest.

$$217.3 \times 10^2, 22.6 \times 10^{3-1}, 0.031 \times 10^{5-3}, 2.5 \times 10^{4-1}$$

$$\boxed{217.3 \times 10^2} \quad \boxed{226 \times 10^2} \quad \boxed{31 \times 10^2} \quad \boxed{250 \times 10^2}$$

(2) (3) (1) (4)

Answer (b) $0.031 \times 10^5, 217.3 \times 10^2, 22.6 \times 10^3, 2.5 \times 10^4$ [2]

- 9 It is given that $m = 2.1 \times 10^7$ and $n = 3 \times 10^4$.
Expressing your answers in standard form, find

(a) $m \div n$,

(b) $n^2 + m$.

(a) $(2.1 \times 10^7) \div (3 \times 10^4)$

$\frac{2.1}{3} \quad 0.7 \times 10^{3-1}$

$\frac{21}{30} \quad 7 \times 10^2$

$\frac{1}{10}$
0.7

(b) $n^2 + m$
 $(3 \times 10^4)^2 + (2.1 \times 10^7)$

$9.0 \times 10^{8-1} + 2.1 \times 10^7$

$90 \times 10^7 + 2.1 \times 10^7$

$(90 + 2.1) \times 10^7$

$92.1 \times 10^{7+1} = 9.21 \times 10^8$

$(3 \times 10^4)^2$
 $(3)^2 \times (10^4)^2$
 9×10^8

Answer (a) 7×10^2 [1]

(b) 9.21×10^8 [2]

TYPE 2: SCENARIO BASED.

You just read and check whether it is

ADD / SUB / MULTIPLY / DIVIDE.

- 3 The population of a country is 3.2×10^6 .
There are 8×10^5 children.

- (a) What fraction of the whole population are children?
Give your answer in its simplest form.

(a) $\frac{\text{CHILD}}{\text{TOTAL}} = \frac{8 \times 10^5}{3.2 \times 10^6} = \frac{8}{3.2 \times 10}$
 $= \frac{8}{32} = \boxed{\frac{1}{4}}$

- (b) Find the number of adults.
Give your answer in standard form.

ADULTS = TOTAL - CHILD
 $= (3.2 \times 10^{6-1}) - (8 \times 10^5)$

$32 \times 10^5 - 8 \times 10^5$

$(32 - 8) \times 10^5$

$24 \times 10^{5+1}$

2.4×10^6

Answer (a) [1]

(b) 2.4×10^6 [1]

- 5 The distance from the Earth to the Sun is e kilometres, where $e = 1.5 \times 10^8$.
The distance from the Sun to Mercury is m kilometres, where $m = 6 \times 10^7$.

(a) Express $e : m$ as the ratio of two integers in its simplest form.

(b)



The diagram shows when the Earth, the Sun and Mercury are in a straight line, with the Sun between the Earth and Mercury.
Find the distance from the Earth to Mercury.
Give your answer in standard form.

Answer (a) : [1]

(b) km [2]

Decimals

1) ADD/SUB:

$$1.73 + 2.6$$

$$\begin{array}{r} 1.73 \\ + 2.6 \\ \hline \end{array}$$

$$\begin{array}{r} 1.73 \\ + 2.60 \\ \hline 4.33 \end{array}$$

2) 0.16×0.04 0.0064
 $2dp + 2dp = 4dp$

$$\begin{array}{r} 16 \\ \times 4 \\ \hline 64 \end{array}$$

1.2×8 9.6
 $1dp + 0dp = 1dp$

$$\begin{array}{r} 12 \\ \times 8 \\ \hline 96 \end{array}$$

3) $\frac{1.6}{0.4} = \frac{16}{4} = 4$

$$\frac{0.16}{0.40} = \frac{16}{40} = 0.4$$

$$\frac{6.3}{9.0} = \frac{\cancel{6}3\cancel{7}}{\cancel{9}0\cancel{1}0} = 0.7.$$